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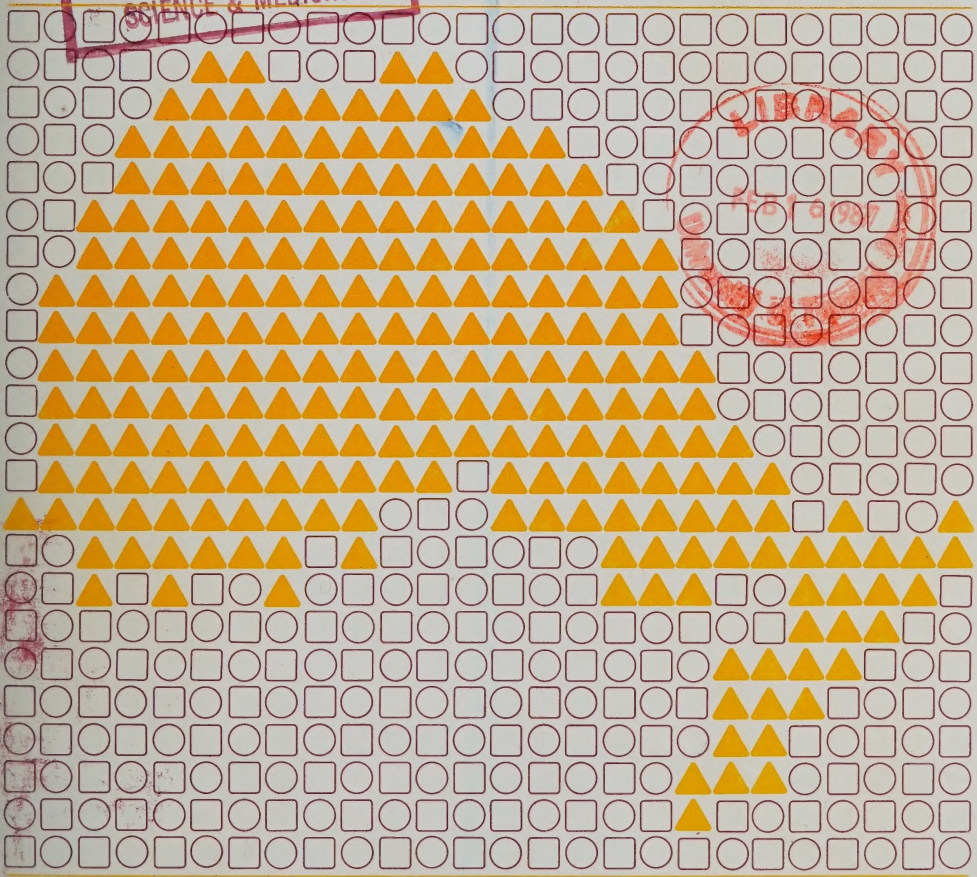
Volume 8, Number 1, Winter 1987

The Health Effects of Exposure to Wood Dusts

Voluntary Health and Safety Committees in Alberta

International Workshop and Conference on Training and Education in Occupational Hygiene



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Occupational Health in Ontario

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Murray M. Finkelstein,
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The Health Effects of Exposure to Wood Dusts

Summary

The health effects of wood dust are reviewed. In addition, a study was carried out to assess whether occupational exposure to wood dust might be associated with an increase in mortality from cancers of the nose and sinuses in Ontario. It was concluded that sinonasal cancer is a rare cause of death. In Ontario less than one death per year is likely to be due to occupational exposure to wood dust.

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Many species of wood, both imported and domestic, have commercial uses. Constituents of many woods may produce toxic effects in man. The structural components of wood are cellulose, hemicellulose and lignin. It is believed that chemicals found mainly in the heartwood of the tree are responsible for most toxic effects. Some of these substances act as food reserves, some as hardening agents, and others protect against mechanical injuries or attack by bacteria, fungi, insects and larger animals. The agents responsible for many of the toxic reactions produced by wood in humans have not been specifically identified. Some reactions to wood dust, such as cough and sneezing, may be non-specific reactions to dust *per se*, but others, such as asthma and dermatitis, may be related to sensitivity to the chemical constituents of particular woods. No attempt will be made in this review to discuss every conceivable reaction to the dust of any wood to which Ontario workers might be exposed; rather, the health effects of exposure to wood dusts will be discussed in general, with special mention of certain woods when these might be relevant to the health of Ontario workers. The adverse effects of wood dusts may be divided among several classes:

1. *Skin and Mucous Membrane Effects*
   Dermatitis – irritant
   – allergic
   Conjunctivitis (Eye inflammation)
   Rhinitis (Nasal inflammation)

2. *Respiratory Effects*
   Irritant
   Asthma
   Chronic Airflow Obstruction

3. *Cancer*
   Nasal, Sinus
   Other Sites

A discussion of these effects is presented in the following sections.

Skin and Mucous Membrane Effects

Dermatitis and Conjunctivitis

The literature dealing with the toxic effects of wood on skin has been extensively reviewed by Woods and Calnan.[1] Toxic woods, nearly always in the form of sawdust, may affect the skin and mucous membranes by direct contact, or constituent chemicals may be absorbed and produce general symptoms. The skin can be damaged by the mechanical action of bristles and splinters, by chemical irritation or sensitization or by a combination of these.

Irritant chemicals are often found in the outer part of tropical trees, and they produce their worst effects on timber workers where the trees are felled. The clinical picture is that of an irritant dermatitis with redness and blistering. The conjunctivae of the eyes are also often severely affected.

Sensitizing chemicals (i.e. those producing allergic reactions) are more often found among the extractives of the heartwood, and therefore affect sawyers, carpenters and joiners, and polishers and finishers exposed to fine dust. The picture is that of an airborne contact dermatitis, beginning on the dorsa of the hands and forearms, and on the eyelids, face and neck and rapidly involving the genitals through handling in micturition. If the clothing gives inadequate protection, fine dust may drift inside and affect the sweaty areas of the axillae, waistband and groin, and, sometimes, the ankles and dorsa of the feet. Mild cases of dermatitis may show only redness and slight irritation, but there is often a papular or blistering dermatitis, which may progress to chronic dermatitis after repeated exposures.

A catalogue of irritating and sensitizing woods is given in Reference 1. Among those that might be commonly encountered in Ontario are Douglas fir, white cedar, beech and oak.

There are no data relating prevalence of skin reactions to airborne dust concentrations. Dust removal by suitable exhaust ventilation and attention to personal hygiene are perhaps the best preventive measures, but once sensitization has occurred, avoidance of further contact with the wood responsible might be required.

Rhinitis (Nasal Inflammation)

Wood dust is commonly deposited in the nose, where it may provoke physiological clearance mechanisms such as sneezing and nasal discharge. In addition, certain individuals may develop nasal allergies to various woods.[2,3] Wilhelmsson and Drettner[3] did a cross-sectional

epidemiological study of Swedish furniture workers. They found that 20 per cent of exposed workers reported perennial nasal hypersecretion, compared with 12 per cent of slightly exposed or non-exposed workers. In addition, 54 per cent of exposed workers showed abnormally increased nasal mucus transit times as shown by the delay in the passage of dyed mucus through the nose. The mean concentration of wood dust in the air of this factory was 2 mg/m^3, and in only a few cases was the Swedish TWA of 4 mg/m^3 exceeded.

Andersen and colleagues[4] examined 68 Danish furniture workers. The most frequent of the workers' complaints were nasal dryness, eye irritation, nasal obstruction, prolonged colds and frequent headaches; there was no unexposed comparison group. Nasal mucus transit time was increased, and the prevalence of workers with abnormal transit times increased with the dust levels. Nine subjects with abnormal transit times were re-examined at home after a weekend away from work, and in six of the nine, the transit time had returned to normal. The authors found that inert plastic dust did not change the transport rate of nasal mucus and concluded that the effect of wood was due to soluble chemical substances in the dust. Boysen and Solberg[5] reasoned that one might be able to detect histological changes in nasal mucosa induced by wood dust exposure. They obtained biopsies from the anterior curvature of the middle turbinate of 113 furniture workers and 54 unexposed control individuals. Metaplastic squamous epithelium and dysplasia were observed more frequently among the furniture workers, as was hyperplastic rhinitis. The metaplastic alterations were considered to be nonspecific, possibly related to age, humidity, dust and infections, but possibly also to carcinogens. The authors suggested that the areas of dysplasia represent preneoplastic epithelial alteration, but it is not yet known whether these areas might indeed progress to frank malignancy. There was no attempt to correlate histological findings with factory dust levels.

Effects on Respiratory Function

There are two broad categories for the possible effects of wood dust on respiratory function, namely, allergic and non-allergic. The wood species most likely to produce allergic (asthmatic) lung responses in workers in Ontario is western red cedar. Dusts of other commonly used woods might, in principle, produce 'industrial bronchitis' and airways obstruction, but there is, as yet, no good evidence that exposure to wood dust leads to chronic non-allergic respiratory changes.

Only a small proportion of the dust generated in woodworking operations is in the respirable size range capable of penetrating to the small airways, and total tracheobronchial deposition, for nose breathing, seldom exceeds 10 per cent of the inhaled aerosol mass as very few particles greater than five microns aerodynamic diameter will penetrate the nose.[6] Hounam and Williams[7] carried out a dust survey in five furniture factories in the United Kingdom and found that sawing operations produced the coarsest dust, and sanding, the finest. Most of the mass of the airborne dust had an aerodynamic equivalent diameter in excess of five microns. Similarly, Holness and colleagues[8] found that much of the dust measured in four Ontario furniture factories was larger than respirable size. Only that dust deposited in the airways would be expected to be capable of inducing acute or chronic changes in the airways.

Pulmonary Airway Effects Not Clearly Related to Allergy

Holness *et al.*[8] compared the pulmonary function of 48 Ontario cabinetmakers with that of 45 controls. The woodworkers had been exposed to wood dust for a mean duration of 8.3 ± 7.7 years; there was no difference in pulmonary function, as measured on the first working day of the week, between the woodworkers and the controls. Over a work shift, measurements of FVC and FEV_1 among the woodworkers declined on average by about two per cent, while there was no change among the controls. In contrast to these findings for lung volumes, there were no significant changes in mid-expiratory flow rates over the shift. Changes of the magnitude reported for the lung volumes are unlikely to produce symptoms, and, indeed, there were no significant differences in the prevalence of respiratory symptoms between woodworkers and controls.

Al Zuhair *et al.*[9] measured pulmonary function among 119 men at two English furniture factories. Total dust levels were generally well below 5 mg/m^3. In one of the two factories there was an average decline in FVC and FEV_1 over the workshift of about 100 ml; in the second factory a statistically significant decline did not occur. In neither factory was there a decline in mid-expiratory flow rates. The percentage of workers with respiratory symptoms did not differ significantly from that in the normal working population.

Andersen *et al.*[4] measured FEV_1 and FEF_{25-75} among 68 Danish furniture workers and found no differences from

predicted values. Air sampling in the factories found 25 samples with wood dust concentrations less than 5 mg/m^3 and 43 samples with concentrations greater than 5 mg/m^3.

Whitehead and colleagues[10] measured the pulmonary function of 571 New England woodworkers. Three hundred and fifty individuals worked with hardwoods (mostly maple) and 221, with pine. On the basis of work history and area dust sampling, individual cumulative dust exposures were calculated and the workers were divided among high, medium, and low exposure groups. The pulmonary function test results of the workers were compared with values predicted by the Knudson[11] reference equations. For FVC there was, on average, no difference between the observed and predicted values, nor was there a trend with the level of exposure. For the never-smokers, there was no difference between the observed and predicted values of FEV_1. Maximal mid-expiratory flow rates tended to be lower than predicted values. Measurements were made during the working day, and one cannot determine whether these flow rates (MMEF), which are inherently a very variable measure, might reflect acute or chronic changes.

All available pulmonary function studies of woodworkers are cross-sectional in nature; as such, they might underestimate a deleterious effect of wood dust exposure if severely affected workers had a tendency to leave the industry. It seems likely that woodworkers have small changes in pulmonary function over the course of a work shift that are probably related to irritation of the airways. These changes appear to be of a magnitude that are not usually associated with unpleasant symptoms, and there appears to be little evidence that significant chronic changes occur.

Allergic (Asthma)

A number of woods, including oak, mahogany and western red cedar, have been identified as being capable of inducing asthmatic reactions.[2] The best studied of these woods is western red cedar, and Chan Yeung[12] notes that the respiratory syndrome caused by occupational exposure to red cedar is fairly characteristic. Workers with specific bronchial reactions to cedar dust had worked for many years with a variety of woods without respiratory symptoms and experienced symptoms only after steady exposure to the red cedar dust for a period of months. Nocturnal cough and wheeze were often the first symptoms. With continuing exposure, symptoms tended to

occur earlier in the day. Later on, some of these patients had severe attacks of asthma immediately on exposure, and constant breathlessness with effort. Upper respiratory symptoms of nasal discharge, sneezing and obstruction were present in two-thirds of the patients. A prominent feature was the absence of a previous personal or family history of allergic sensitivity. After cessation of exposure, most patients recovered completely within six months.

All of the studies of asthma in woodworkers have been either case series or cross-sectional studies. Because workers who become ill would tend to leave the industry, it is difficult to determine true incidence rates. In a survey of cedar mill workers in British Columbia, Chan Yeung and colleagues[13] found asthma in one per cent of the cedar workers; they estimated the true incidence in this environment to be higher, around four to five per cent.

There is no study that correlates the incidence of disease with dust levels. Therefore, no dose-response assessment is possible.

Cancer

Nasal Cavity and Paranasal Sinuses

During the 1960s an association was noted between employment in the furniture industry in England and an increased risk of cancer of the nasal cavity. Since then, numerous international studies have confirmed the association between exposure to hardwoods in furniture manufacture and adenocarcinoma of the paranasal sinuses.[14] Additional studies have found that the risk is neither limited to the furniture industry nor to hardwood exposure. Elwood[15] performed a case-control study of 121 men seen for cancer of the nasal cavity or paranasal sinuses in British Columbia between 1939 and 1977. He found increased relative risks (2.5) associated with occupations involving exposure to wood (chiefly forestry and carpentry), and with smoking (4.9). Exposure was primarily to domestic softwoods. Studies in Scandinavia,[16] Australia[17] and the United States[18] confirm that exposures outside of the furniture industry (primarily to softwoods) may be associated with increased risk of sino-nasal cancer. In Ontario, Finkelstein[19] found that several deaths of sino-nasal cancer from 1973-1983 may be attributable to occupational exposure to wood dust. The disease is, however, so rare that wood dust exposure is probably associated with less than one death in the province per year (Appendix).

The carcinogenic agent(s) in wood dust have not been identified, nor are there any data relating workplace dust levels to the risk of cancer.

Assessment of Other Sites

Acheson[20] recently reported on the follow-up of a cohort of 5,108 men who had been employed in the English furniture industry prior to 1968. With the exception of nasal cancer, there was no significant increase in mortality, nor any trend towards increasing mortality with increasing dustiness of the work, for cancer of any site. Olsen and Sabroe[21] reported a six-year follow-up of 40,000 active and retired members of the Danish carpenter and cabinetmakers trade union; no major causes of death, except nasal cancer, were significantly above the national average. Milham[22] studied the mortality experience over four years of 700,000 active and retired members of the AFL-CIO United Brotherhood of Carpenters and Joiners of America. Surprisingly, the SMR for sino-nasal cancer was only 51. There was a significant excess of stomach cancer, which was more than compensated for by a significant deficit of colonic cancer. The same pattern, but not reaching statistical significance, was observed among the English furniture makers.[20] The Danish study[21] found no excess of any digestive cancer.

It is concluded that the only cancers significantly associated with wood dust exposure are cancers of the nasal cavity and paranasal sinuses.

Occupational Exposure Limits

Occupational exposure to wood dust may be associated with dermatitis, inflammation of the eyes and nose, reversible airways obstruction and cancer of the nasal cavity and paranasal sinuses. Unfortunately, there are very little data pertaining to exposure conditions and virtually none that relate the incidence of disease to dust levels. The ACGIH has recommended TLVs of 1 mg/m^3 for hardwoods in furniture making and 5 mg/m^3 for non-allergenic softwoods with a STEL of 10 mg/m^3 for softwoods.[23] The ACGIH differentiated between hardwoods and softwoods because of their impression that it was the hardwoods that were associated with sino-nasal cancer. Since their assessment, reports in the literature have suggested that individuals exposed primarily to softwoods may be at risk of sino-nasal cancer as well; thus, there appears to be little justification for setting separate exposure limits for these two classes of woods.

In the absence of sufficient data to provide a dose/response curve for the non-carcinogenic effects of wood

dust and with the evidence of a very small risk of sinonasal cancer associated with exposure to wood dust, the selection of an upper limit of occupational exposure based on health grounds is difficult.

The following discussion reflects the sparse scientific data available for the standard setting process, but attempts to approach the problem by considering this knowledge in the light of the actions of other regulatory bodies.

The Swedish occupational standard for wood dust is 4 mg/m^3. There is no documentation to support this numerical standard, but their Criteria Group for Occupational Standards did examine the relationship between dust levels and upper respiratory irritation.[24]

The health effects of wood dust remove it from the purely nuisance dust category to which the ACGIH assigns an upper limit of 10 mg/m^3. As discussed earlier, the ACGIH has assigned two exposure limit values to wood dust. The upper limit of 5 mg/m^3 is based on the Danish study,[4] in which the investigation found that workers exposed to wood dust above 5 mg/m^3 more frequently experienced inflammation of the middle ear and that common cold symptoms, when present, lasted longer than in persons exposed to wood dust levels below 5 mg/m^3.

The data relating to slowed muco-ciliary nasal transport show that delay occurs at levels below 5 mg/m^3. Although the health significance of these data is not clear, the ACGIH Threshold Value Committee agreed that impaired muco-ciliary function may be important in the development of nasal adenocarcinoma in those exposed to wood dust due to the prolonged retention of wood dust in the nasal cavity. Although the ACGIH committee then uses this argument to set a limit for hardwoods of 1 mg/m^3, they acknowledge that there is no information available on the mucostasis properties of different woods. Using this reasoning, the 1 mg/m^3 would be appropriate for dust derived from hardwoods if it were only this dust that was associated with the occurrence of nasal cancers. However, as shown in this document, softwoods are also associated with an increased risk of nasal cancer.

This risk is very small, but where there is a risk of cancer it has been customary for regulatory bodies to select low exposure levels or the lowest exposure level reasonably achievable. Pursuing an exposure limit based on this approach and in the absence of any better scientific data, the lower of the two ACGIH limits might be chosen to apply to airborne dust from all types of wood. Given the widespread and varied nature of the occupational exposure to wood dust, the final selection of an exposure limit for wood dust cannot be based on

scientific criteria. Because contact with some woods can produce allergic skin reactions, procedural controls to reduce skin contact with wood and wood dust are important to reduce occupational disease in the wood handling industries.

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Appendix

A Study of Nasal and Sinus Cancers in Ontario: 1973-1983

There are several accepted occupational risk factors for cancer of the nasal cavity and paranasal sinuses: these include exposures to wood dust, nickel refining processes, and boot and shoe manufacturing and repair.[1] This study was carried out to assess whether occupational exposure to wood dust might also be associated with an increase in mortality from these cancers in Ontario.

Ontario Statistics

In the 11-year period 1973-1983, 157 men 30 years of age or more were certified as dying of cancer of the nose or sinuses; this is an average of 14 deaths per year. Four per cent of men were 30-44 years of age at death, 52 per cent were 45-64, 22 per cent were 65-74 and 22 per cent were 75 years of age or older.

Not all cases of sino-nasal cancer are fatal. In the period 1973-1975 there were 65 new cases, an average of 22 per year.[2] In 1971 the ratio of new cases to deaths was 29/18 = 1.6.[3] The incidence rate in Ontario is thus approximately 50 per cent higher than the mortality rate.

Materials and Methods

Deaths in Ontario for the period 1973-1983 receiving ICD code 160 (malignant neoplasm of nose, nasal cavities, middle ear and accessory sinuses) were identified by searching a computer tape of all Ontario deaths provided by the Ministry of Health. A control was selected for each case from all deaths in the same year, matching on age and sex, by use of random numbers. Demographic and occupational data were manually abstracted from the death certificates.

When possible, directories of Canadian manufacturers were consulted for additional information about potential occupational exposures. In a number of instances no occupational information was given on the death certificate; such data were available for 147/157 (94 per cent) of the cases and 143/157 (91 per cent) of the controls.

The data were analysed using a matched-pairs technique;[4] the relative risk is approximated by A/B where A is the number of discordant pairs in which the exposed individual is the case and B is the number of pairs in which the exposed individual is the control. The relative risk is a measure of risk among exposed individuals compared with unexposed persons.

Results

a) Nickel Production

The well-known association between nickel refining at Sudbury and Port Colborne and cancers of the nasal cavity and sinuses was readily apparent; 13 cases (eight per cent of the Ontario total) occurred among men with exposure in the nickel industry, while none of the controls were identified as having been employed in this industry.

b) Wood Dust Exposure

Wood dust exposures have been divided among five categories: furniture and cabinetmaking; carpentry; miscellaneous industrial; pulp, paper and forest products; miscellaneous construction. The distribution of the study population among these categories is given in Table 1. In the 11-year period there were eight deaths of sino-nasal cancer among men with definite wood dust exposure (three furniture workers and five carpenters) compared with three exposed controls; the relative risk of exposure is thus $8/3 = 2.7$. None of the odds ratios are formally statistically significant, but tests of statistical significance are not meaningful in this context; given the magnitude of the relative risk, the sample size is too small to permit statistically significant tests.

c) Other Associations

The odds ratios for other occupational exposures are listed in Table 2.

Discussion

There are major limitations to a study in which occupational data are derived solely from death certificates in that there is the potential that the investigator will be unable to determine whether or not an individual has been exposed to the agent of interest and will almost certainly be unable to determine the extent of exposure. Nevertheless, a study of this kind can be useful in estimating to a first approximation the magnitude of a hazard in Ontario. There is little doubt that exposure to hardwoods in the furniture industry is associated with sino-nasal cancer,[5] and a recent study from British Columbia suggests that the risk is present with exposure to domestic softwoods as well.[6] Three men dying of sino-nasal cancer in Ontario during 1973-1983 were cabinetmakers or furniture workers; one was born in Hungary and another in England, and they may have had wood dust exposure outside of Canada. Five carpenters died of sino-nasal cancer. No cases had a forest industry occupation specified, although

it is possible that some men said to be labourers (not otherwise specified) may have been employed in the forest industry or some men may have worked in this industry earlier in life. Two cases and two controls had employment in the pulp and paper industry. Construction workers were more represented among the cases than among the controls, but any association with wood dust exposure is quite tenuous.

Table 1 **The Distribution of Wood Dust Exposures Among the Study Population**

Cases		Controls	Odds Ratio
	I *Furniture and Cabinet Making*		
Cabinetmaker	Age 37	Furniture Restorer	3
Cabinetmaker	Age 81		
Furniture Worker	Age 64		
	II *Carpentry*		
Carpenter	Age 71	Carpenter	2.5
Carpenter's Helper	Age 47	Carpenter	
Carpenter	Age 62		
Carpenter	Age 45		
Carpenter – Industrial	Age 76		
	III *Miscellaneous Industrial*		
		Mechanic and Engineer – – Brush Manufacture	
		Labourer – Box Manufacture	
	IV *Pulp and Paper*		
Paper Mill	Age 58	Labourer – Pulp	1.0
Supervisor	Age 50	Blacksmith – Paper Mill	
	V *Miscellaneous Construction*		
Builder – Government	Age 80	Construction	3
Labourer – Construction	Age 50	Roofer	
Self-Employed Contractor	Age 48		
Bricklayer	Age 45		
Truck Driver – Construction	Age 66		
Crane Operator – Construction	Age 48		

Table 2 **Other Associations Between Occupation and Sino-Nasal Cancer**

Exposure	Cases	Controls	Relative Risk
Nickel Manufacture	13	0	—
Leather/Shoes	3	2	1.5
Solder Fumes	8	1	8
Textiles	1	1	1

Conclusions

It is probable that several deaths in Ontario in the period 1973-1983 are attributable to exposure to wood dust; it is also possible that several non-fatal cases of sino-nasal cancer may be attributable to this exposure. Nevertheless, sino-nasal cancer remains a very rare cause of death, and it is likely that, on average, less than one death per year in the province of Ontario is attributable to occupational exposure to wood dust.

Résumé

Cet article examine les effets de la poudre de bois sur la santé. De plus, une étude a été effectuée pour évaluer les liens possibles entre l'exposition à la poudre de bois en milieu de travail et les décès dus aux cancers du nez et des sinus en Ontario. Selon les conclusions de l'étude, peu de décès sont occasionnés par ces types de cancers. En Ontario, il semble que moins d'un décès par année soit attribuable à l'exposition à la poudre de bois en milieu de travail.

Acknowledgments

Bob Kusiak identified the cases and selected the controls. Jackie McPherson abstracted the death certificate data.

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Leonard D. Sorochan

Voluntary Health and Safety Committees in Alberta*

Summary

The focus, structure, thrust and development of health and safety committees in Alberta comes from The Joint Work Site Health and Safety Committee Regulation #197/77. Committees may be designated at individual worksites by order of the minister, and at present they total 144.

What is required for compliance with the regulation for mandatory committees is actively encouraged and promoted for voluntary committees. Contact has been initiated with over 500 and it is believed that there could potentially be as many as 2,000.

This paper reviews the promotional activity for the development and monitoring of such committees.

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The genesis for all health and safety committees in Alberta is the Occupational Health and Safety Act.

The focus of health and safety committees comes from the Joint Work Site Health and Safety Committee (JWSH & SC) Regulation #197/77, enacted in 1977. This legislation governs mandatory committees or, as we in Alberta say, 'designated' committees. Such committees are designated at individual worksites by order of the minister. The last amendment, which was the third, added more companies to the list and was enacted in early 1978, bringing designated committees up to a total of 144. Since then, there have been no amendments to the original legislation.

The structure, thrust and development of non-mandatory or voluntary committees is influenced by this legislative base. Whatever was required for compliance under the mandatory committee regulation is actively encouraged and promoted in our voluntary program.

The remainder of this presentation will only be concerned with the *voluntary* health and safety committee program as it operates in Alberta.

Our minister is an enthusiastic supporter of the worksite health and safety committee programs. This is evidenced by excerpts from recent speeches to the industrial public and to the division staff.

In addition to the minister's statements, the division policy states:

> . . . that committees established on a voluntary basis can have a beneficial influence in identifying health and safety concerns, in preventing accidents and in promoting safer attitudes.

The policy goes on to say:

> Voluntary committees . . . are more likely to be effective than those which are established arbitrarily by the order of a third party (the government).

* Presented to the Canadian Association of Administrators of Labour Legislation/Occupational Safety and Health (CAALL/OSH) at its annual meeting, held in Calgary, July 17, 1985.

Finally, the policy states:

> . . . the acceptable functions are to:
> a) identify unhealthy or unsafe situations;
> b) make recommendations for improvement of work site health and safety; and to
> c) establish and maintain educational programs.

The above policies should demonstrate our resolve in promoting and expanding the voluntary health and safety committee program to include all the industrial sectors.

The basic program for the voluntary health and safety committee is composed of three phases: 1) promotional, 2) developmental and 3) monitorial.

The *promotional* phase is performed by all field personnel of the division. During their daily activities the staff will take opportunities to promote and encourage the employers to initiate a voluntary health and safety committee program. This approach is accompanied with the assurance that assistance is readily available.

For employers, the most convincing arguments for creating a health and safety committee have to do with money. If it can be demonstrated that assessments will decrease substantially if accidents and injuries are reduced, an employer will give you his attention. Discussions centred on decreasing costs associated with downtime, extra overtime to catch up on production, possible damage costs and reduced material costs seem to persuade the employer much more readily than a discussion about a moral or legal responsibility that the employer has to his workers.

Next is the *developmental* stage, during which time various types of assistance are provided by the division and especially the Education and Program Development Branch. This period usually begins with an orientation meeting with the management and on occasion includes the workers. This initial meeting lays out the organization of the committee: functions, advantages, roles and non-roles. This latter point is especially important to clarify, for it allays many fears that employers have regarding the management prerogative. It also provides the workers with a clear understanding of the jurisdictional limit of health and safety committees. This initial meeting usually clears up any misconceptions.

After the initial session, workers *and* employers are encouraged to attend regularly scheduled introductory courses on the operation of health and safety committees. This is a three-hour course, complete with certificate and materials. We encourage the company to send a min-

imum of two representatives, usually the co-chairmen. Our program encourages co-chairmen; one from management and one from the workers, who alternate chairing the meetings and share the total responsibility. The course will provide them with various exercises, simulation and case studies to illustrate the principles associated with safety committees. Some of the key materials in this course are the committee handbook, the members' guide, the minute book, the committee members list poster and the hardhat decals.

After this training session a committee should be ready to attempt its first meeting. An officer from our branch will attend on request.

The *monitorial* phase begins at the point when the committee can function on its own without our division providing assistance. Committees are encouraged to keep close contact with us during the first year. We also encourage them to send us a copy of their minutes although we do not *insist* on the minutes being sent in because of the amount of paperwork this would generate, and the resources required to process that paperwork would make this task prohibitive.

Of the minutes that are forwarded to us, a review is made. The primary aim is to identify contraventions of the regulations. This review may require follow-up action, such as a telephone call, to clarify statements made in the minute form. Problems or unresolved issues may be referred to the inspection branch for additional follow-up or response. Minute-monitoring may have hidden implications such as: Is there any legal responsibility associated with the possession of knowledge relating to contravention of a regulation? What types of eventual uses could the minutes be put to if introduced as evidence in claims procedures or in a court of law? Who is responsible if some crucial statement is missed during the review?

Advice and consultation during this monitorial phase encourages the committees to move from the 'fix-it' syndrome to the policy or program function. At this point in the development, we are most concerned with the process and, to a lesser extent, with the product. We will concentrate on providing information, encouraging a pro-active view, and discouraging tedious accident reviews. Thus, a committee can mature towards solving matters related to health and safety, and have accident prevention as a primary objective.

Observations

After some time, the committee reaches a stable level and reflects the sum total of its environment and growth pattern. According to our Education Officers, the success of voluntary health and safety committees in Alberta has been influenced by the following factors:

a) the economy
b) the rules, regulations and documentation
c) the management (climate)
d) the committee itself

The economy in general, and the profit of this company in particular, will be the single most influencing factor on the committee's success or survival. Little explanation is needed to realize the effect of this factor.

All the documentation relevant to the situation, beginning with the Act, regulations, contracts and written company policy, will affect the safety committee role. Included in this factor are the audio-visual and print materials that are available for assistance and guidance.

The above two factors may be viewed from the objective side, and one may accept them as 'givens' or factors beyond the control of the local committee. This places the next factor, management commitment, as the first immediate variable which affects the committee's functioning. Regardless, if the first two factors are nurturing or discouraging, this factor has the ability to overcome or circumvent all obstacles that may hinder the success of the committee. In other words, if the first two factors are most positive, a negative management attitude will guarantee a failure, whereas a positive management attitude will allow for a potential committee success.

Finally, the make-up or structure of the committee is important. The size, representatives, place of meeting and all other minor factors at the local level will add up to assist or hinder the operation of the committee. Perhaps the most significant factor in this category is the rank or position of the management co-chairman. If the representative is the 'safety-man' or if the representative is the vice-president in charge of operations, then this will be a strong indicator of the degree of management commitment. (This probably means access to funds as well.) By the same token, if the worker co-chairman is the 'rabble rouser' or the 'negotiator', then this will indicate the level of worker commitment to the process.

The voluntary and interactive approach just described proved very appropriate in dealing with committee promotion at construction, and especially at drilling, sites,

two of the most hazardous industrial sectors. Often, these sites are difficult to fit into conventional forms of mandatory programs. The flexibility of our approach, combined with the firmness of our intent along with the co-operation and support of these industries, enabled a system of Joint Work Site Health and Safety Committees to be established which were responsive to industries' specific needs.

It is roughly stated that contact has been initiated with approximately 500 voluntary health and safety committees and that a longer search would produce approximately 1,000 voluntary committees, which leads us to believe that, potentially, up to 2,000 voluntary committees could be operating.

Considering that there are 5,088 Alberta firms with 20 or more workers, and that the present rate of growth of establishing new committees is approximately five new committees per month, the potential number of established voluntary committees is very encouraging and rewarding.

Résumé

C'est le règlement n° 197/77 sur les comités conjoints de santé et sécurité en milieu de travail qui régit l'élaboration, la structure, le mandat et la portée des comités de santé et sécurité au travail en Alberta. On compte présentement 144 comités en milieu de travail, lequels sont désignés par arrêté ministériel.

On encourage les comités bénévoles à respecter les critères auxquels les comités obligatoires doivent se soumettre pour se conformer au règlement. On a pris contact avec plus de 500 comités bénévoles et on estime que leur nombre pourrait atteindre 2 000.

Cet article examine la publicité qui entoure l'élaboration et la surveillance de ces comités.

G.S. Rajhans, M.Sc.(Eng.), P.Eng., C.I.H.

International Workshop and Conference on Training and Education in Occupational Hygiene

Summary

For the first time in history, the World Health Organization (WHO), the Commission of the European Communities (CEC), the International Commission of Occupational Health (ICOH) and the American Conference of Governmental Industrial Hygienists (ACGIH) co-organized an international workshop, followed by a conference, on 'Training and Education in Occupational Hygiene'. This event was held in Luxembourg from June 16 to 20, 1986.

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Workshop, June 16-18, 1986

The aims were:

1) to review the current status of certification requirements and academic qualifications necessary for the practice of occupational hygiene;
2) to offer proposals for harmonizing education, training and certification for practice in occupational hygiene;
3) to assess current and future needs for occupational hygienists.

The workshop consisted of three groups; group I was responsible for the preparation of documentation on needs, scope and function; group II, for training and education and group III, for professional standards. After considerable discussion and deliberation the following was agreed:

1. Occupational hygiene is the science and art of anticipation, recognition, evaluation and control of health hazards arising from the work environment. This scope is often extended to the control of ergonomic factors and to the control of emissions from the workplace to the community. The hazards include chemical, physical and biological exposures associated with either immediate (acute) and/or long-term (chronic) effects.
2. The improvement of working conditions to prevent the occurrence of adverse effects in workers requires the co-operative skills of many professions, including those of the occupational physician and occupational hygienist. The education and experience of the occupational hygienist develops the scientific and engineering skills necessary to assess the risks and to propose effective controls for the complex health and safety problems of the occupational environment.
3. The overall scope of occupational hygiene and the functions of occupational hygienists are common to all countries. The required number of hygienists and

their levels of expertise will vary according to the country and working conditions therein.

4. Occupational hygiene can be practised at two different levels of duties and responsibilities: the professional occupational hygienist and the occupational hygiene technician.
5. Preparation for practice at the level of the professional occupational hygienist requires comprehensive, higher level education and training in a wide variety of related subject areas and skills. Preparation for the occupational hygiene technician requires educational training in sampling and measurement skills appropriate to the specific situation. In general, the needs of professional occupational hygienists are fulfilled by long-term university programs, while the education and training needs of technicians are usually met through successful completion of short-term specialized courses. Developing nations will probably initiate efforts in occupational hygiene before comprehensive internal educational programs for professional education and training resources in other countries could be utilized. In the interim, they will pursue occupational hygiene technician education and training on a national level to initially address the problems.
6. It is essential to have competent assessment of the risks and formulation of proposed corrective actions in the occupational environment. This requires that the competence of practitioners of occupational hygiene be judged against standards.
7. An independent body of professional hygienists at the national or international level will normally establish the standards and judge the competence of practitioners, designating successful applicants to be certified or accredited to practise at the appropriate professional or technician level. Where necessary, the professionals in a country or region may choose to apply to certifying bodies in other countries.
8. While assessment of competence may be performed on a national basis, the achievement of equivalent minimum professional standards should be the aim, thus facilitating the interchange of occupational hygienists; for example, within the European Community.
9. It is desirable for the protection of the public that the vital role and function of the body, in providing assessments of competence by qualified experts of the profession, should be recognized by the public. The latter can be promoted by specific reference to competent persons, as defined in this report, in governmental regulations involving occupational hygiene.

Conference, June 19-20, 1986

The aims were:

1) to discuss the various documents prepared during the workshops; and,
2) to establish international standards for education, training and certification for occupational hygienists.

On June 19th, several papers were presented on the organizational approach to occupational hygiene and current practices in the U.S.A., Canada and the EEC. In addition to the above presentations, there was a paper entitled 'The Trade Union Approach to Occupational Hygiene'.

On June 20th, the last day of the conference, the workshop documents were discussed, and the following conclusions and recommendations were approved by the majority of the attendees.

Draft Conclusions and Recommendations of the International Conference on Training and Education in Occupational Hygiene

Having regard to:

a) the findings of the workshop related to the need, scope and function of occupational hygiene, the training and education and professional standards in this field,
b) the work of the United Nations organizations, and, in particular, the ILO Recommendation and Convention 161 and 171 on occupational health services,
c) the EEC treaties, the EEC programs of action on safety and health at work, and the relevant directives on workers' protection,
d) national legislation on worker protection,
e) the requirement to review the current and future needs for occupational hygiene,
f) the broad nature of occupational safety,
g) the need for harmonizing education, training and qualifications in this discipline,

the following recommendations are made:

1) The reports on occupational hygiene (need, scope and function; education and training; professional standards) together with the executive summary be accepted by the conference;
2) the reports and the executive summary of the workshops should be commended to the WHO, CEC, ICOH, ACGIH and other organizations and bodies

concerned with this area for the further development of occupational hygiene practice. To this end, action should be taken, as required, to further this development;

3) the scope of occupational hygiene, the functions and professional standards of qualified experts in occupational hygiene and other persons with duties within occupational hygiene should be recognized nationally and their professional responsibilities identified in legislation. Public awareness of their role and responsibilities concerning community hazards should be encouraged;
4) the role and responsibilities of occupational hygiene in relation to small and medium-sized companies should be examined with a view to removing the disparity that exists between these and larger companies in the management of safety and health risks;
5) the international organizations such as WHO, ILO and CEC should establish programs for the development of occupational hygiene as concerns;
6) minimum standards of education, training and experience should be established internationally in order to facilitate the mobility of occupational hygienists between different countries;
7) research should be encouraged in the interdisciplinary approach to occupational hygiene, with special reference to assessment and control measures;
8) individual countries should be encouraged to establish their own learned or professional society/group in occupational hygiene to facilitate development of the science and profession. The International Commission on Occupational Health, and other international or well-established national bodies in the field, should help catalyse and support the growth of such societies and groups;
9) further meetings should be organized on:
   - monitoring the progress made towards the development of education, training and experience, and harmonization of occupational hygiene as a discipline, including the role of certification;
   - the role of occupational hygiene in the development and application of exposure limits.

Résumé

Pour la première fois, l'Organisation mondiale de la santé (OMS), la Commission des Communautés européennes (CCE), la Commission internationale de la médecine du travail (CIMT) et l'American Conference of Governmental Industrial Hygienists (ACGIH) ont organisé conjointement, du 16 au 20 juin 1986, un séminaire

international au Luxembourg, qui a été suivi d'une conférence sur la formation et l'éducation en hygiène du travail.

Book Reviews

Practical Guide to Respirator Usage in Industry.

G.S. Rajhans and D.S.L. Blackwell
Butterworths, 1985.

Published by Butterworths, 1985.

Price $26.40 U.S.

With increased usage and new designs over recent years, respiratory protective equipment (RPE) has taken its rightful place amongst the other hygiene control measures. However, there is still a considerable lack of knowledge and awareness about the use and limitations of this equipment, even amongst us hygienists. This new book definitely fulfils the need for good guidance on setting up and supervising a sound RPE program. As the book is intended for managers and safety specialists as well as occupational health professionals, the authors have given important practical advice in a readable form rather than a complete and somewhat theoretical reference on the subject.

Chapter 1 overviews respiratory hazards and evaluation. Whilst the hygiene assessment is a prerequisite of any RPE program, the authors have attempted to get the message across in simple terms for the benefit of non-occupational health professionals. However, I fear that the rambling nature of the text is too confusing to achieve this purpose and could have been simplified to the barest bones, with reference to hygiene literature.

In the remaining chapters the book really comes into its own. Use and limitations of each class of equipment, selection, fitting, supervision, training, maintenance, cleaning and medical assessment are thoroughly described in Chapters 2 to 6. The lack of reference material on training and maintenance confirms the low level of attention often paid to these important elements in practice and the need for such sensible guidance. Where appropriate, the authors have summarized the important factors in tabular and list form, which might have been further improved by concluding each chapter with an outline of the main points. This would certainly have helped to reinforce the message to those readers not totally conversant with the subject.

That being said, Chapter 7 does pull all these points together in advising how to set up an RPE program, including a model written format.

The book nicely rounds up with chapters describing how problems have been solved in specific case studies

and with ideas for future research that highlights the need to gauge effective protection factors.

This book lives up to its title, and, as a working manual, certainly has a place on my shelf.

Nigel J. Brace

The Effects of Whole Body Vibration

H. Dupuis and G. Zerlett

Published by Springer-Verlag, Berlin, Heidelberg, New York, Tokyo.

Price $41.00

This English translation of the German monograph first published in 1984 is a very complete review of the literature with respect to knowledge in occupational medicine on the effects of whole-body vibration.

Following a brief review of terminology and definitions, stress-strain concepts and the weighted vibration quantity (K value) for vehicles and ships, the acute and chronic effects of whole-body vibration are reviewed and discussed. The biodynamic reaction or vibration behaviour of the whole body, its organs and the physiological functions are discussed in detail; and the conclusions are summarized, which is helpful to the reader. The attributable diseases for occupational groups that have been reported are reviewed, and it is clear that diseases of the spinal column take first place, followed by the digestive and nervous systems.

Preventive measures by engineering controls, administrative measures to restrict duration of exposure, personal protection and medical surveillance are briefly reviewed, as are the international criteria and guidelines for measurement and evaluation. As the authors quite rightly conclude, 'Protective measures against mechanical whole-body vibrations require knowledge of not only the kind and extent of stress that occurs but also the effects on man.'

This monograph provides its readers with a better understanding of the subject, and highlighting the lack of detailed knowledge in so many areas should stimulate research. It is recommended reading for all interested in preventive medicine, whether they be physicians, nurses, hygienists or safety personnel.

P.L. Pelmear

Publications Available From the Government Book Store

Revised Regulations of Ontario, 1980 Regulation 692/80 Industrial Establishments	$2.00
Revised Regulations of Ontario, 1980 Regulation 691/80 Construction Projects	$2.00
Revised Regulations of Ontario, 1980 Regulation 694/80 Mines and Mining Plants	$2.00
Regulation respecting Lead – made under the Occupational Health and Safety Act Ontario Regulation 536/81	$1.00
Regulation respecting Mercury – made under the Occupational Health and Safety Act Ontario Regulation 141/82	$1.00
Regulation respecting Vinyl Chloride – made under the Occupational Health and Safety Act Ontario Regulation 516/82	$1.00
Regulation respecting Coke Oven Emissions – made under the Occupational Health and Safety Act Ontario Regulation 517/82	$1.00
Regulation respecting Asbestos – made under the Occupational Health and Safety Act Ontario Regulation 570/82	$1.00
Regulation respecting Abestos on Construction Projects and in Buildings and Repair Operations – made under the Occupational Health and Safety Act Ontario Regulation 654/85	$1.00

Regulation respecting Isocyanates – made under the Occupational Health and Safety Act Ontario Regulation 455/83	$1.00
Regulation respecting Benzene – made under the Occupational Health and Safety Act Ontario Regulation 732/84	$1.00
Regulation respecting Acrylonitrile – made under the Occupational Health and Safety Act Ontario Regulation 733/84	$1.00
Regulation respecting Arsenic – made under the Occupational Health and Safety Act Ontario Regulation 176/86	$1.00
An Occupational Health Nurse's Guide to the Preparation of a Policy and Procedure Manual	$2.00
A Guide to the Occupational Health and Safety Act	$1.00
Regulation for X-ray Safety, Registration and Plan Review made under the Occupational Health and Safety Act Ontario Regulation 263/84	.60
X-ray Safety Code, Ontario Regulation 45/84	.20
Designated Substances in the Workplace: A General Guide to the Regulations	$2.00
Designated Substances in the Workplace: A Guide to the Lead Regulation	$1.00
Designated Substances in the Workplace: A Guide to the Benzene Regulation	$1.00
Designated Substances in the Workplace: A Guide to the Silica Regulation	$1.00

Designated Substances in the Workplace: A Guide to the Mercury Regulation	$1.00
A Guide for Joint Health and Safety Committees and Representatives in the Workplace	$1.00

Coming Events

February 4 – 6, 1987	International Congress on Safety, Health and Environment, National Safety Council, SION, BOMBAY, INDIA – 400 022.
May 4 – 6, 1987	First Conference on Education and Training in Occupational Health, International Commission on Occupational Health. McMaster University, HAMILTON, ONTARIO, CANADA. For further information, contact: Mrs. P. M. Yake, Occupational Health Program, McMaster University, Health Sciences Centre, Room 3H50, 1200 Main Street West, Hamilton, Ontario, Canada, L8N 3Z5. Telephone: (416) 525-9140, Extension 2332.
May 24 – 30, 1987	ILO's 11th World Congress on the Prevention of Occupational Accidents and Diseases, 'Co-operation Towards a Better Working Environment: The Future of Safety and Health at Work'. STOCKHOLM, SWEDEN. For further information, contact: Swedish Organizing Committee, Post Box 22236, S-104 22, Stockholm, Sweden.
June 9 – 11, 1987	4th International Meeting on Low Frequency Noise and Vibration to be held in UMEA. University of UMEA, HUMANISTHUSET, SWEDEN. For further information, contact: Dr. W. Tempest, Multi-Science Publishing Company Limited, 107 High Street, Brentwood, Essex, U.K. CM14 4RX.
July 7 – 10, 1987	World Conference on Chemical Accidents, ROME, ITALY. Contact: Secretariat, CEP Consultants Ltd., 26 Albany St., Edinburgh, Scotland EH1 3QH 031 557 2478.
August 8 – 13, 1987	International Congress of Epidemiology, HELSINKI, FINLAND. Contact: IEA-Congress Secretariat, POB 189, SF-00171 Helsinki, Finland; 358-0-602163.
September 5 – 17, 1987	Inter-Noise 87, BEIJING, CHINA. Contact: Inter-Noise 87 Secretariat, 5 Zhongguancun Street, PO Box 2712, Beijing, China.

September 27 – October 2, 1987	XXII International Congress on Occupational Health. SYDNEY, AUSTRALIA. For further information, contact: The Secretariat, XXII International Congress on Occupational Health, G.P.O. Box 2609, Sydney, N.S.W., Australia 2001.

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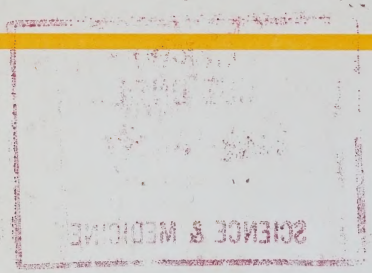

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